

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A lithographic process for forming a pattern (20) in relief on a mass (10) of polymeric material for use in micro-devices and nano-devices, the process comprising the steps of:

preparing ~~the~~ said mass (10) of polymeric material and a die (12) having a surface region (14) facing towards ~~the~~ said mass (10) of polymeric material and which reproduces in negative ~~the~~ said pattern in relief (20),

heating ~~the~~ said die (12) and putting ~~the~~ said mass (10) of polymeric material into contact with the die (12) in any temporal sequence in such a way that the parts of ~~the~~ said mass (10) of the polymeric material in contact with ~~the~~ said surface ~~zone~~ region (14) are subject to softening, and

separating ~~the~~ said die (12) from the mass (10) of polymeric material on the surface of which ~~the~~ said pattern in relief (20) has been formed,

~~the said process being characterized by the fact that~~ wherein the heating of at least part of the die (12) is obtained by the generation of thermal energy upon dissipation of another form of energy in at least one region (16) of ~~the~~ said die (12),

wherein said region (16) of said die (12) in which thermal energy is generated remains for less than 25 seconds and

wherein said region (16) of the die (12) in which thermal energy is generated is in the form of a layer.

2. (currently amended): A process according to Claim 1, ~~characterized in that~~wherein the said mass (10) of polymeric material has a three-dimensional form.

3. (currently amended): A process according to Claim 1, ~~characterized in that~~wherein the region (16) in which energy is dissipated with consequent generation of heat is at a smaller distance than 100 μm from the surface carrying the pattern in relief of the said said die (12).

4. (currently amended): A process according to Claim 1, ~~characterized in that~~wherein the said said mass (10) of polymeric material has a two-dimensional form and is in the form of a sheet or thin film deposited on a substrate (22).

5. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the region (16) of the said said die (12) in which thermal energy is generated remains for less than 25 seconds, ~~preferably less than~~ 50 milliseconds, at a temperature greater than or equal to the glass transition temperature of the polymeric material (10).

6. (currently amended): A process according to claim 1, ~~characterized in that~~wherein it includes a plurality of successive cycles of heating, contacting and separation.

7. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the heating phase includes a plurality of short successive cycles in such a way that the impression of the pattern is the result of a series of successive indentations of the die (12).

8. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the steps of heating the region (16) of the die (12) and contacting it with the mass (10) of polymeric material are synchronized.

9. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the ~~said~~said die (12) is put into contact under pressure with the mass (10) of polymeric material.

10. (currently amended): A process according to Claim 9, ~~characterized in that~~wherein ~~the said~~said pressure is exerted in a pulsed manner.

11. (currently amended): A process according to claim 9, ~~characterized that~~wherein the ~~said~~said pressure is obtained mechanically, or with electrostatic, magnetic, electromagnetic forces and/or with acoustic shock waves.

12. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the ~~said~~said die (12) is pre-heated to a desired temperature.

13. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the quantity of thermal energy generated varies locally within the ~~said~~said region (16) of the die (12).

14. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the ~~said~~said polymeric material (10) is of thermoplastic type.

15. (currently amended): A process according to Claim 14, ~~characterized in that~~wherein the ~~said~~said polymeric material (10) is chosen from the group consisting of polycarbonates, polymethylmethacrylates, polyethylene terephthalates, polyethylmethacrylates, polybutylene terephthalates, polyolefins and their mixtures.

16. (currently amended): A process according to claim 1, ~~characterized in that~~wherein at least one portion of the surface of the die (12) is clad with a release agent.

17. (currently amended): A process according to claim 1, ~~characterized in that~~wherein, after the pattern (20) in relief has been formed on the surface of the mass (10) of polymeric material, a treatment is performed with an attack agent so as to remove the polymeric material (10) where it has been compressed.

18. (currently amended): A process according to claim 1, ~~characterized in that~~wherein the surface region (14) of the die (12) which reproduces the pattern in relief in negative is

aligned with pre-existing reference signs on the mass (10) of polymeric material or, if the ~~said~~ material (10) is a thin film, on the substrate (22) on which the ~~said~~ film is deposited.

19. (currently amended): A process according to claim 1, ~~characterized in that~~ wherein the ~~said~~ region (16) of the die (12) in which thermal energy is generated is of electrically conductive material.

20. (currently amended): A process according to Claim 19, ~~characterized in that~~ wherein the energy dissipated in heat is provided by an electric current (18) which flows in the ~~said~~ electrically conductive material.

21. (currently amended): process according to Claim 20, ~~characterized in that~~ wherein the direction of flow of the ~~said~~ electric current (18) is substantially perpendicular to the direction of relative movement of the mass (10) of polymeric material and the die (12).

22. (currently amended): A process according to claim 1, ~~characterized in that~~ wherein the ~~said~~ region (16) of the die (12) in which thermal energy is generated coincides with the ~~said~~ surface region (14) which reproduces the ~~said~~ pattern in relief in negative.

23. (canceled).

24. (currently amended): A process according to Claim 23~~1~~, ~~characterized in that~~ wherein the ~~said~~ layer has a thickness less than 2 μm .

25. (currently amended): A process according to Claim 23~~1~~, ~~characterized in that~~wherein ~~the said~~the said layer has a non-uniform thickness in such a way that it is possible locally to vary the quantity of thermal energy generated.

26. (canceled).

27. (currently amended): A process according to claim 19, ~~characterized in that~~wherein ~~the said~~the said electrically conductive material is a metal, preferably chosen from the group consisting of Ti, Ni, Cr, Cu, Ag, Au, W, Ir, Ta, Pd, Mo, V and their alloys.

28. (currently amended): A process according to claim 19, ~~characterized in that~~wherein ~~the said~~the said electrically conductive material is a semi-conductor, ~~preferably silicon~~.

29. (currently amended): A process according to claim 23~~1~~, ~~characterized in that~~wherein ~~the said~~the said layer of electrically conductive material is obtained by doping a surface layer (16) of an intrinsically semiconductive or initially lightly-doped substrate, in such a way as to increase its conductivity with respect to the underlying portion (24) of the substrate.

30. (currently amended): A process according to Claim 29, ~~characterized in that~~wherein ~~the said~~the said layer (16) to be doped is the outermost layer of silicon of a silicon-on-insulator (SOI) structure.

31. (currently amended): A process according to Claim 29, ~~characterized in that~~wherein
the doping operation is performed by ion implantation.

32. (canceled).

33. (currently amended): A process according to claim 20, ~~characterized in that~~wherein
~~the said~~said electric current (18) is induced by applying a potential difference between at least
two electrodes (26) connected to ~~the said~~said electrically conductive material.

34. (currently amended): A process according to claim 20, ~~characterized in that~~wherein
~~the said~~said electric current (18) is induced by a variable magnetic field.

35. (canceled).

36. (canceled).

37. (withdrawn): A die for performing a process according to claim 1, comprising at
least one region (16) capable of generating thermal energy upon dissipation of another form of
energy.

38. (withdrawn): A die according to Claim 37, further including an inner thermally
insulating layer.

39. (new): A process according to claim 27, wherein said metal is preferably chosen from the group consisting of Ti, Ni, Cr, Cu, Ag, Au, W, Ir, Ta, Pd, Mo, V and their alloys.

40. (new): A process according to claim 28, wherein said semi-conductor is silicon.